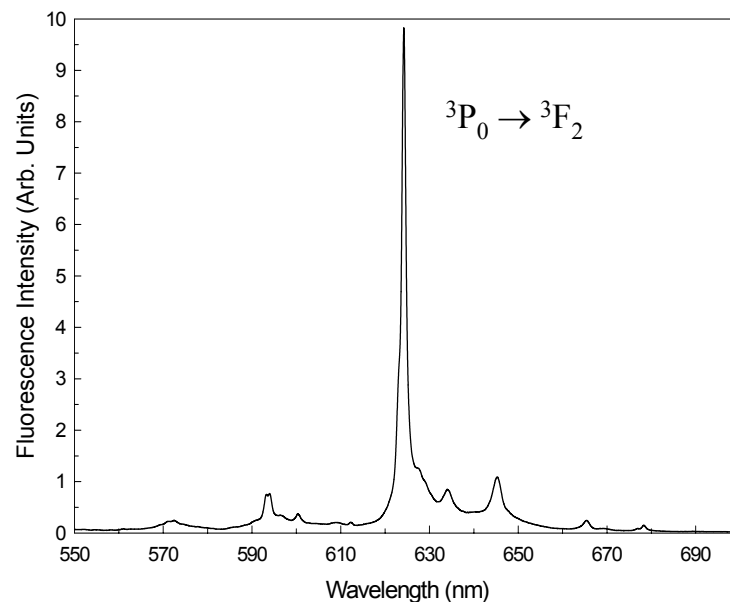


# Investigation of Spectroscopic and Laser Properties of Praseodymium Ions in Apatite Crystals and Novel Organic Dyes in Solid State Plastic Hosts

Dhiraj K. Sardar, University of Texas at San Antonio, DMR-0099479

Because of increasing demand for efficient solid-state lasers for applications in various fields, there is growing interest in characterizing spectroscopic and laser properties of different rare earth ions in crystalline hosts. The trivalent praseodymium ion,  $\text{Pr}^{3+}$ , has proven to be a promising ion for laser applications due to its large number of optical transitions in the visible and infrared spectral regions. This has motivated us to investigate the spectroscopic and laser properties of  $\text{Pr}^{3+}$  doped in  $\text{Sr}_5(\text{PO}_4)_3\text{F}$  (known as S-FAP). The S-FAP is an important host for laser active ions because of its high crystal field splittings and large transition cross sections. Here we present a fluorescence spectrum of Pr:S-FAP.

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Fluorescence spectrum of  $\text{Pr}^{3+}$  in S-FAP for the  $^3\text{P}_0 \rightarrow ^3\text{F}_2$  transition at room temperature. The strongest emission at 625 nm is about an order of magnitude higher than those of rest of the transitions. The emission cross section of this transition is found to be  $0.5 \times 10^{-19} \text{ cm}^2$  which is comparable to the well-known laser transition at 1064 nm in Nd:YAG. The linewidth of the 625 nm transition is measured to be about  $31 \text{ cm}^{-1}$  at room temperature, which is about four times larger than that of 693 nm transition in  $\text{Cr:Al}_2\text{O}_3$  laser material.

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## Education:

Four undergraduates (Francisco Castano, Cody H. Coeckelenbergh, Charles C. Russell, and Felipe S. Salinas) contributed to this work. Felipe S. Salinas graduated in May 2003, and entered graduate school in Fall 2003. Cody H. Coeckelenbergh and Charles C. Russell are still working in our laboratory and are expected to graduate in December 2005. Felipe has received an award for “outstanding presentation” at the Texas section of APS Meeting in 2002.

## Laser Experiment:

Cody, Charles, and Felipe are adjusting an Ar ion laser and an Integrating sphere.

